

Applicants: Jae-In JEONG and Tae-Gyoon LIM  
Serial No.: 10/534,134  
Filed: May 6, 2005  
Page 4

REMARKS

Claims 1-10 were pending in the application. Claims 1 and 4 have been amended and claims 2, 3, 5, 7, 9 and 10 have been cancelled. Accordingly, claims 1, 4, 6, and 8 are presently being examined.

Section 1, 2, and 3 of the Office Action rejected claims 1-10 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,404,982 to Mariner et al. ("Mariner patent") in view of U.S. Patent No. 3,553,010 to Rubisch ("Rubisch patent").

According to the Office Action, the Mariner patent shows each element of the invention recited in claims 1-10 except a protective barrier having an aluminum-rich compound layer. However, the Office Action also states that the Rubisch patent shows an aluminum rich compound layer which is subject to a heat treatment process.

According to this Office Action, it would have been obvious to one of ordinary skill in the art to adapt the Mariner patent with the aluminum-rich compound layer of the Rubisch patent to further increase the thermal resistance as well as the stability with respect to oxidation.

With respect to claim 1, applicants hereinabove have amended claim 1 to recite a resistance-heated boat having a graphite block and a protective barrier, the protective barrier being 20-200 micrometers thick including: (1) an aluminum-rich compound layer; (2) a nitrogen containing compound layer; and (3) "boron containing compounds that are distributed in the form of lump-shaped crystalline deposits." Support for this amendment

Applicants: Jae-In JEONG and Tae-Gyoon LIM  
Serial No.: 10/534,134  
Filed: May 6, 2005  
Page 5

can be found, inter alia, on page 9 in lines 16-30, on page 10 in lines 6-8, and in Figures 3 and 4 of the present specification.

Unlike the present invention recited in amended claim 1, the Mariner patent relates to a flash evaporator vaporization boat having a graphite body and an outer surface coated with pyrolytic boron nitride.

Also, unlike the present invention recited in amended claim 1, the Rubisch patent relates to a graphite electrode having a graphite (or carbon) body, a primary layer and a metallic cover each of which may or may not be mixed with boron itself, that is, (1) the primary layer is 90 to 100% silicon and 0 to 10% sodium, magnesium, calcium, boron, aluminum, titanium, zirconium, manganese, iron, carbon, nitrogen, phosphorous and/or oxygen, separately or in combination; and (2) the metallic cover is 85 to 100% aluminum and 0 to 15% sodium, magnesium, boron, silicon, phosphorus, oxygen, copper, zinc, lead, titanium, zirconium, chromium, manganese, iron, cobalt and/or nickel, separately or in combination.

In contrast, the composition of the present invention as recited in amended claim 1 which has a boat structure of G-Al-N; (graphite-aluminum-nitrogen) includes "lump-shaped crystalline deposits" of "boron containing compounds". Such deposits of boron containing compounds are not taught or suggested by the Mariner or Rubisch patents taken alone or in combination. Instead the Mariner patent only teaches a boron nitride layer (not crystalline boron compound lumps) and the Rubisch patent only teaches the option of mixing boron with the primary and/or

Applicants: Jae-In JEONG and Tae-Gyoon LIM  
Serial No.: 10/534,134  
Filed: May 6, 2005  
Page 6

cover layer. Thus, for at least this reason, amended claim 1 is not unpatentable over the Mariner patent in view of the Rubisch patent.

Furthermore, the Mariner patent teaches a G-B (graphite-boron) structure and the Rubisch patent teaches a G-Si-Al (graphite-silicon-aluminum) structure. Thus, the structures of the Mariner and Rubisch patents are different from each other and from the G-Al-N structure taught by the present invention and recited in amended claim 1.

In addition, the Rubisch patent teaches that "silicon which is dissolved mainly in aluminum reacts with the carbon of the fundamental body forming silicon carbide when the operational temperature of the protected parts exceeds about 550°C, which leads to a tear free and solid bond between protective layer to the carbon part", see column 2 at lines 25-31 of the Rubisch patent. Thus, employing an aluminum reaction with silicon at the surface of the graphite, the major teaching of the Rubisch patent, is not found in the present invention. Instead, the present invention as recited in amended claim 1 teaches a heat treated protective barrier at the surface of the graphite which need not include silicon. Thus, in the absence of the present invention, one of skill in the art would be led by the teaching of the Mariner and Rubisch patents to require a silicon-rich layer at the surface of the graphite.

Thus, in view of the amendments to claim 1 and the remarks above, applicants respectfully request that the rejection of claim 1 as being unpatentable over the Mariner patent in view of the Rubisch patent be reconsidered and withdrawn.

Applicants: Jae-In JEONG and Tae-Gyoon LIM  
Serial No.: 10/534,134  
Filed: May 6, 2005  
Page 7

With respect to claim 4, applicants hereinabove have amended claim 4 to more clearly recite a method of manufacturing a resistance heated boat having the steps of: (1) forming a graphite block into the form of a boat; (2) coating in a spraying manner or in a painting manner the surface of the graphite block with a nitrogen containing compound after adding catalysts; and (3) producing a protective barrier at the surface of the graphite block by positioning aluminum inside the evaporation cavity formed at the center of the graphite block, and causing a reaction between the aluminum and the nitrogen containing compound through a heat treatment process. Support for this amendment can be found, inter alia, on page 8 in lines 1-4, on page 11 in lines 15-18, and on page 13 in lines 15-16 of the present specification.

Whereas the Mariner patent's boat is manufactured with one step of BN (boron nitride) coating on the graphite body by "chemical vapor deposition" which is performed at a heat furnace at a controlled temperature between 1800°C to 2200°C, see column 2 at lines 25-29 of the Mariner patent, the resistance-heated boat of the present invention as recited in amended claim 4 can be manufactured by a two step process, that is: (1) coating (spraying or painting) the surface of the graphite body with a nitrogen-containing compound; and then after adding catalysts, (2) heat treatment to cause a reaction between the aluminum and BN to produce the protective barrier. In other words, unlike the BN coating of the Mariner patent, the present invention as recited in amended claim 4 allows for simple application of the nitrogen-containing compound by "spraying or

Applicants: Jae-In JEONG and Tae-Gyoon LIM  
Serial No.: 10/534,134  
Filed: May 6, 2005  
Page 8

painting" instead of the "chemical vapor deposition" of the Mariner patent.

Furthermore, unlike the Mariner patent, the present invention need not "increase the density" of the boron nitride (BN) outer coating, see column 1 at lines 57-60 of the Mariner patent since as recited in amended claim 4, the present invention provides the protective barrier by a heat-treatment process with catalysts for a stable and continuous metal barrier.

Also, the Rubisch patent does not teach or suggest the method of the present invention, at least because the purpose of Rubisch's invention is to "arrest oxidation" in the field of "arc electrodes". Therefore, the purpose and aim of the Rubisch patent is quite different from the present invention, and further is for a different art than the resistance-heated boat of the present invention, that is, the arc electrode art.

Further, the flame injection of the Rubisch patent causes a binding between the graphite and the protective layer, see column 2 at lines 19-21 of the Rubisch patent in contrast to the reaction between the aluminum and nitrogen caused by the heat treatment process recited in amended claim 4 of the present invention. Therefore, the method recited in amended claim 4 of the present invention is basically different from the Mariner and Rubisch patents taken alone or in combination. Moreover, a person skilled in the art cannot simply reach the present invention as recited in amended claim 4 by combining the two cited patents due to the fundamentally different applications (spraying or painting N, adding catalysts, reacting Al+N,

Applicants: Jae-In JEONG and Tae-Gyoon LIM  
Serial No.: 10/534,134  
Filed: May 6, 2005  
Page 9

etcetera) and the different arts (resistance-heated boats versus arc electrodes).

Since claims 6 and 8 depend on amended claim 4 and because a claim which depends on another claim is subject to all the limitations of the other claim, applicants respectfully submit that claims 6 and 8 are not unpatentable for at least the same reasons as amended claim 4.

In view of the amendments to claim 4 and the remarks above, applicants respectfully request that the rejection of claims 4, 6 and 8 as being unpatentable over the Mariner patent in view of the Rubisch patent be reconsidered and withdrawn.

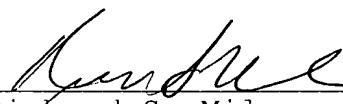
In view of the remarks above, the cancellation of claims 2, 3, 5, 7, 9, and 10, and the amendments to claims 1 and 4, applicants respectfully request that the rejections in the Office Action be reconsidered and withdrawn, and earnestly solicit a Notice of Allowance.

If a telephone interview would be of assistance in advancing prosecution of the subject application, applicants' undersigned attorney invites the Examiner to telephone him at the number provided below.

Applicants: Jae-In JEONG and Tae-Gyoon LIM  
Serial No.: 10/534,134  
Filed: May 6, 2005  
Page 10

No fees are deemed necessary in connection with the filing of this Amendment. However, if any such fees are required, authorization is hereby given to charge the amount of any such fees to Deposit Account No. 03-3125.

Respectfully submitted,

  
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